F **Fermilab**
Beams Division
NuMI Project

NuMI PROJECT at FERMILAB

INSTALLATION COORDINATION PLAN

May 15, 2002
Version 0

This document describes the Installation Coordination Plan for the NuMI Technical (WBS 1.1) and Scientific Components (WBS 2.0). The most important aspect of this Plan is the clear delineation of the roles, responsibilities and primary lines of communication of the various individuals having supervisory responsibilities for installation activities including overall installation management and coordination. Difficulties of installation, exceptions to installation plans, and field interferences between installation activities are expected to be appropriately communicated. The explanatory "Direction" categories detailed in this plan are limited to the execution of installation. Also presented are the distinct geographic areas of installation activities and related access restrictions for the various areas. An appendix itemizes major elements of work organized by geographic area.

It is essential that the installation of NuMI technical and scientific components be in accord with the principles and core functions of Integrated Safety Management (ISM). To this end, the ISM principles and core functions are to be included throughout all levels of installation coordination and all specific installation activities.

Installation activities associated with technical equipment are, with some specific exemptions, planned to involve Davis-Bacon labor. Installation of the MINOS Near Detector, consisting of experimental apparatus, is exempt and will not necessarily involve Davis-Bacon labor. An appendix lists selected activities for which Davis-Bacon exemption will likely be requested.

SCOPE OF INSTALLATION

- Installation of the remaining extraction and transport magnets, instrumentation and related components in the Main Injector enclosure
- Installation of transport magnets, instrumentation, LCW piping, cable tray and related components in the NuMI stub and its Extension after removal of the construction shield wall
- Installation of all NuMI equipment in MI-60, MI-62, Target and MINOS Service Buildings

- ❖ Installation of all beamline elements in the Carrier Tunnel and Pre-Target enclosure between the Main Injector and the Target Hall
- ❖ Installation of all beamline elements and shielding in the Target Hall
- ❖ Installation of the Horn Power Supply, RAW skids and associated controls in the Target Support Rooms
- ❖ Installation of the Absorber, Hadron and Muon Detectors, and other elements in the Absorber Hall
- ❖ Installation of all equipment in the Absorber Access Tunnel
- ❖ Installation of all Muon Detectors in the Muon Alcoves
- ❖ Installation of the MINOS Near Detector and associated electronics

ROLES and RESPONSIBILITIES

Level 2 Manager for Technical Components

Definition: The L2 Manager for Technical Components is responsible for the management and technical oversight of the efforts described under NuMI Project WBS 1.1. These efforts include specifically those of Level 3 Managers for Technical Components and other assigned resources during the design, fabrication, and installation phases of the technical components for the NuMI Project.

Number: There is a single Level 2 Manager for Technical Components. This Manager has an assigned Deputy who will serve with similar authority in the absence of the Manager.

Direction: The L2 Manager for Technical Components is directly responsible to the NuMI Project Manager. Receives input from the MINOS Manager, the NuMI Project ES&H Coordinator, Project Installation Coordinator, Project Engineers, Level 3 Managers for Technical Components, Near Detector Installation Manager and other assigned resources as necessary and appropriate.

Installation Duties: The L2 Manager for Technical Components shall be responsible for

- ❖ Management and technical oversight of the installation efforts described under NuMI Project WBS 1.1
- ❖ Maintaining a current WBS 1.1 Baseline Schedule for installation of technical components with the assistance of the NuMI Project Scheduler
- ❖ Requesting the necessary labor resources needed for executing the installation of technical components from the Beams Division, the Particle Physics Division, the Technical Division, the MINOS Collaboration or from other organizations. This includes formal requests for engineering, drafting, technicians, skilled labor, Target Floor Manager and task managers
- ❖ Making final decisions on overall priorities of technical component installation activities and on any significant changes in installation plans due to conflicts or unexpected problems

- ❖ Defining major elements of installation in the Main Injector enclosure, including NuMI stub, in accord with scheduled accelerator shutdowns
- ❖ Presenting NuMI installation requirements to Laboratory management to positively influence the start and duration of accelerator shutdowns so that NuMI installation activities in the Main Injector enclosure will be efficiently conducted and completed.
- ❖ Resolving conflicts of installation of technical components and infrastructure in the Absorber or MINOS areas with installation of scientific components in the MINOS Near Detector Hall with the MINOS Manager
- ❖ Resolving significant ES&H issues with the NuMI Project ES&H Coordinator pertinent to performance or consequence of technical component installation activities
- ❖ Insuring adherence to the principles of Integrated Safety Management throughout the installation process

Source: The L2 Manager for Technical Components has already been assigned to the NuMI Project from the Beams Division.

MINOS Manager

Definition: The MINOS Manager is responsible for the management and technical oversight of the efforts described under NuMI Project WBS 2.0. These efforts include specifically those of the Near Detector Installation Manager, MINOS Collaboration members and other assigned resources during the design, fabrication, and installation phases of the scientific components of the MINOS detectors.

Number: There is a single MINOS Manager. This Manager has two assigned Deputies who will serve with similar authority in the absence of the Manager.

Direction: The MINOS Manager is directly responsible to the NuMI Project Manager. Receives input from the L2 Manager for Technical Components, the NuMI Project ES&H Coordinator, Project Installation Coordinator, Project Engineers, Near Detector Installation Manager, L3 Managers for Technical Components, MINOS Collaboration members and other assigned resources as necessary and appropriate.

Installation Duties: The MINOS Manager shall be responsible for

- ❖ Management and technical oversight of the installation efforts described under NuMI Project WBS 2.0
- ❖ Maintaining a current WBS 2.0 Baseline Schedule for installation of scientific components with the assistance of the NuMI Project Scheduler
- ❖ Requesting the necessary labor resources needed for executing the installation of the MINOS Near Detector from the Particle Physics Division, MINOS Collaboration members, the Beams Division, the Technical Division or from other organizations. This includes formal requests for engineering, drafting, technicians, skilled labor, MINOS Floor Manager and task managers

- ❖ Making final decisions on overall priorities of scientific component installation activities and any significant changes in installation plans due to conflicts or unexpected problems
- ❖ Resolving conflicts of installation of scientific components in the MINOS Near Detector Hall area with installation of technical components and infrastructure in the MINOS and Absorber areas with the L2 Manager for Technical Components
- ❖ Resolving significant ES&H issues with the NuMI Project ES&H Coordinator pertinent to performance or consequence of scientific component installation activities
- ❖ Insuring adherence to the principles of Integrated Safety Management throughout the installation process

Source: The MINOS Manager has already been assigned to the NuMI Project from the Particle Physics Division.

NuMI Project ES&H Coordinator

Definition: The NuMI Project ES&H Coordinator is responsible for assisting NuMI Project Management in all ES&H aspects of the construction, fabrication, installation, commissioning and operation of the NuMI Project. The ES&H Coordinator provides NuMI Project oversight of these activities to verify compliance with all applicable Environmental, Safety and Health regulations, directives and standards.

Number: There is a single NuMI Project ES&H Coordinator. As related to installation, the Coordinator is assigned two deputies, one for radiation safety and one for conventional safety. The Deputy Coordinator for Conventional Safety will serve with similar authority in the absence of the ES&H Coordinator.

Direction: The NuMI Project ES&H Coordinator is directly responsible to the Project Manager. The Coordinator receives input from the L2 Manager for Technical Components, the MINOS Manager, Project Installation Coordinator, Project Engineers, Level 3 Managers for Technical Components, Near Detector Installation Manager, Floor Managers, Division/Section ES&H personnel and other resources as necessary and appropriate.

Installation Duties: The NuMI Project ES&H Coordinator is responsible for

- ❖ Assisting NuMI Project Management in all ES&H aspects of the installation activities and their associated consequence for the NuMI Project
- ❖ Providing ES&H oversight of installation activities such that their performance and consequence is in accord with applicable ES&H regulations, directives and standards
- ❖ Reviewing and commenting on ES&H programs, plans or documents submitted by fixed-price subcontractors and their sub-tier subcontractors as contractually required. Such submittals shall be accepted by the Coordinator upon his/her satisfaction that they are complete, necessary and sufficient

- ❖ Assuring that there is appropriate flow-down of Fermilab ES&H requirements to fixed-price subcontractors, their sub-tier subcontractors and to Time and Material subcontractors
- ❖ Resolving significant ES&H issues as they may arise with the cooperation of the L2 Manager for Technical Components, the MINOS Manager, the Project Engineers, the Project Installation Coordinator and Floor Managers
- ❖ Coordination of ES&H reviews of technical and/or scientific equipment to be installed or tested as necessary
- ❖ Coordination of ES&H reviews of installation work activities as necessary
- ❖ Advising and/or reviewing, as requested, selected hazard analysis documentation as to its sufficiency for the work being performed
- ❖ Insuring adherence to the principles of Integrated Safety Management throughout the installation process

Source: The NuMI Project ES&H Coordinator has already been assigned to the NuMI Project from the Beams Division.

Project Engineer

Definition: An individual knowledgeable in either electrical or mechanical engineering disciplines and responsible for coordination of interrelated sub-system activities during the design, fabrication, and installation phases of the NuMI Project.

Number: There are two Project Engineers, one being an electrical engineer and one being a mechanical engineer. These individuals shall be appropriately cross-trained so that one can take appropriate action in the absence of the other.

Direction: The Project Engineers are directly responsible to the NuMI Project Manager. In fulfilling their responsibilities for coordination and other duties assigned by the NuMI Project Manager, the Project Engineers receive input from the L2 Manager for Technical Components, the MINOS Manager, the Project Installation Coordinator, Floor Managers, Near Detector Installation Manager, Level 3 Managers for Technical Components and other resources as necessary.

Installation Duties: The two Project Engineers shall provide

- ❖ Coordination of interrelated sub-system activities during the installation phase of the NuMI Project
- ❖ Performance of duties assigned by the NuMI Project Manager
- ❖ Comments and advice on the installation elements of the Baseline Schedule
- ❖ Assistance and advice on overall priorities of installation activities and any significant changes to installation plans due to conflicts or unexpected problems
- ❖ Assistance and advice on the selection and allocation of resources
- ❖ Cooperation with the NuMI Project ES&H Coordinator, the L2 Manager for Technical Components, the MINOS Manager and the Project Installation Coordinator in resolving significant ES&H issues pertinent to performance or consequence of installation activities

- ❖ Oversight of adherence to the principles of Integrated Safety Management throughout the installation process

Source: The two Project Engineers have already been assigned to the NuMI Project from the Beams Division.

Project Installation Coordinator

Definition: An individual knowledgeable in the broad scope of installation activities associated with the NuMI Project and responsible for coordination of all installation activities. This individual is also knowledgeable in the various means and methods of accomplishing these activities as well as project scheduling tools.

Number: There is a single Project Installation Coordinator. The Coordinator may be assisted by one or more deputies in accord with the requirements of fulfilling assigned installation duties.

Direction: The Project Installation Coordinator is directly responsible to the Level 2 Manager for Technical Components and the MINOS Manager. While the Project Installation Coordinator will take direction from each, those directions are essentially not conflicting in that those two positions have fundamentally separate portfolios as regard to installation. For issues related to installation of technical components, the Project Installation Coordinator is responsible to the Level 2 Manager for Technical Components. For issues related to the installation of the MINOS Near Detector and its associated infrastructure, the Project Installation Coordinator is responsible to the MINOS Manager. The Project Installation Coordinator receives input from the NuMI Project ES&H Coordinator, Project Engineers, Floor Managers, Near Detector Installation Manager, Level 3 Managers for Technical Components and other resources as necessary.

Installation Duties: The Project Installation Coordinator shall

- ❖ Provide overall coordination of all NuMI Project installation activities
- ❖ Develop and maintain current Installation Task Lists for each of the major areas of installation (Main Injector, Target and MINOS) in accord with the Baseline Schedule and provide same to assigned Floor Managers and Beams Division Operations Support
- ❖ Provide oversight of the execution of the Installation Task Lists for each of the major areas of installation in cooperation with assigned Floor Managers and Beams Division Operations Support
- ❖ Communicate progress on installation activities to the L2 Manager for Technical Components and the MINOS Manager
- ❖ Provide updates and corrections for the Baseline Schedule to the L2 Manager for Technical Components and the MINOS Manager
- ❖ Coordinate the installation of technical components in the Absorber area with installation of scientific components in the MINOS Near Detector Hall with the MINOS Manager

- ❖ Provide oversight of access and enclosure infrastructure to assure its operability and to enable safe and efficient conduct of installation activities to the best extent reasonably possible
- ❖ Provide assistance and advice on the selection and allocation of resources
- ❖ Provide assistance and advice on overall priorities of installation activities and any significant changes to Installation Task Lists due to conflicts or unexpected problems
- ❖ Cooperate with the NuMI Project ES&H Coordinator, Project Engineers, the L2 Manager for Technical Components and the MINOS Manager and Floor Managers in resolving significant ES&H issues pertinent to performance or consequence of installation activities
- ❖ Advise and/or review, as requested, selected hazard analysis documentation as to its sufficiency for the work being performed
- ❖ Assure adherence to the core functions of Integrated Safety Management throughout the installation process

Source: The Project Installation Coordinator has not yet been assigned to the NuMI Project. Pending the staffing of this position by the NuMI Project Manager, the Level 3 Managers for WBS 1.1.7 and WBS 1.1.8 shall assume the responsibilities of the Project Installation Coordinator.

Level 3 Manager for Technical Components

Definition: A Level 3 Manager for Technical Components is responsible for oversight of the design, fabrication, and installation of a major technical component sub-system or activity of the NuMI Project. This includes budgeting for all material and activities, tracking cost to completion, identifying and preparing change requests as scope changes are identified. The L2 Manager for Technical Components may assign additional installation responsibilities to these Managers.

Number: Eight technical component sub-systems are identified in the NuMI Project WBS at Level 3 for technical components (WBS 1.1.1 thru 1.1.8). Each of these technical sub-systems or activities has either a single manager or two co-managers.

Direction: The Level 3 Managers for Technical Components are directly responsible to the Level 2 Manager for Technical Components. These L3 Managers receive input from the other Level 3 Managers for Technical Components, Project Engineers, MINOS Collaboration members, assigned engineering and physicist staff, the Project Installation Coordinator, Floor Managers, Task Managers, Technical Group Leaders and other resources as necessary.

Installation Duties: The Level 3 Managers for Technical Components shall provide

- ❖ Oversight of the installation of their sub-systems or the conduct of specific assigned activities
- ❖ Delivery of required technical equipment in accord with the Baseline Schedule and developed Installation Task Lists

- ❖ A listing of installation tasks relating to their assigned sub-system to the Project Installation Coordinator to facilitate the Coordinator's generation of area specific Installation Task Lists
- ❖ Comments and advice on developed Installation Task Lists to the Project Installation Coordinator
- ❖ Assistance to the Project Installation Coordinator in resolving scheduling problems or work interferences that may arise before or during the installation activity of their particular sub-system
- ❖ Assistance to the Project Installation Coordinator in providing solutions for any unexpected technical difficulties that arise in their particular sub-system installation or activity area
- ❖ Provide updates and corrections for their portion of the Baseline Schedule to the L2 Manager for Technical Components
- ❖ Execution of additional installation responsibilities as assigned by the L2 Manager for Technical Components
- ❖ Necessary technical information on the use of specialized equipment and/or fixtures for or related to installation for dissemination to Floor Managers, Task Managers and Technical Group Leaders as required
- ❖ Delineation of labor resources required for their installation activity to the L2 Manager for Technical Components
- ❖ Advice on overall priorities of installation activities to the L2 Manager for Technical Components
- ❖ Cooperation in resolving contention for labor resources, installation equipment and MINOS shaft access with the Project Installation Coordinator, the MINOS Floor Manager and the Near Detector Installation Manager
- ❖ Cooperation with the NuMI Project ES&H Coordinator, Project Engineers, the L2 Manager for Technical Components and the Project Installation Coordinator in resolving any ES&H issues pertinent to performance or consequence of installation activities as necessary or requested
- ❖ Adherence to the core functions of Integrated Safety Management throughout the installation process.

Source: Level 3 Managers for Technical Components have already been assigned to the NuMI Project from the Beams Division, the Particle Physics Division and the MINOS Collaboration.

Near Detector Installation Manager

Definition: An individual responsible for the installation of the MINOS Near Detector and its associated support infrastructure. This includes budgeting for all material and activities, tracking cost to completion, identifying and preparing change requests as cost or scope changes are identified. The MINOS Manager may assign additional installation responsibilities to this Manager.

Number: There is a single Near Detector Installation Manager. This Manager is also known as the Level 2 Manager for Near Detector Installation.

Direction: The Near Detector Installation Manager is directly responsible to the MINOS Manager. The Manager receives input from the Project Engineers, the Project Installation Coordinator, the MINOS Floor Manager, MINOS Collaboration members, assigned engineering and physicist staff, selected Level 3 Managers for Technical Components as related to Near Detector infrastructure, Task Managers, Technical Group Leaders and other resources as necessary.

Installation Duties: The Near Detector Installation Manager shall provide

- Oversight of the installation of the MINOS Near Detector and its associated support infrastructure
- Delivery of required scientific equipment in accord with the Baseline Schedule and developed Installation Task Lists
- A listing of installation tasks relating to the installation of the MINOS Near Detector and its associated infrastructure to the Project Installation Coordinator to facilitate the Coordinator's generation of the MINOS area Installation Task List
- Comments and advice on the developed Installation Task List to the Project Installation Coordinator
- Assistance to the Project Installation Coordinator in resolving scheduling problems or work interferences that may arise before or during the installation of the MINOS Near Detector and its associated infrastructure
- Assistance to the Project Installation Coordinator in providing solutions for any unexpected technical difficulties that arise in the execution of installation activities
- Provide updates and corrections for his/her portion of the Baseline Schedule to the MINOS Manager
- Execution of additional installation responsibilities as assigned by the MINOS Manager
- Necessary technical information on the use of specialized equipment and/or fixtures for or related to installation for dissemination to Floor Managers, Task Managers and Technical Group Leaders as required
- Delineation of labor resources required for installation activities to the MINOS Manager
- Advice on overall priorities of installation activities to the MINOS Manager
- Cooperation in resolving contention for labor resources, installation equipment and MINOS shaft access with selected Level 3 Managers for Technical Components, Project Engineers, the Project Installation Coordinator and the MINOS Floor Manager
- Cooperation with the NuMI Project ES&H Coordinator, Project Engineers, the MINOS Manager and the Project Installation Coordinator in resolving any ES&H issues pertinent to performance or consequence of installation activities as necessary or requested
- Adherence to the core functions of Integrated Safety Management throughout the installation process

Source: The Near Detector Installation Manager has already been assigned to the NuMI Project from the Beams Division.

Floor Manager

Definition: An individual responsible for coordinating the work activities of several groups within a specific geographic work area in accord with the installation schedule. A Floor Manager shall be knowledgeable in crane and rigging operations and ES&H. The Floor Manager shall also have OSHA 30 hour construction safety training or equivalent.

Number: There will be two Floor Managers. The Target Floor Manager will be assigned to the upstream area that ranges underground from Pre-Target to the midpoint of the decay pipe. Area of jurisdiction also includes the Target Service Building and its access shaft. The MINOS Floor Manager will be assigned to the downstream area that ranges underground from the midpoint of the decay pipe to and including the MINOS Near Detector Hall. This area of jurisdiction also includes the MINOS Service Building and its access shaft.

Note: A Floor Manager will not be assigned for installation activities in the MI-60 and MI-62 Service Buildings or in the Main Injector enclosure. The Beams Division has an established organization (BD Operations Support) and procedure for accomplishing work in these areas. Rather than establish a new structure for facilitating NuMI related work activities in these areas, the Project Installation Coordinator will work with these structures and serve as the single point of contact for the coordination, sequencing and prioritization of NuMI installation activities.

Direction: The Floor Managers are directly responsible to the Project Installation Coordinator. The Floor Managers receive input from the NuMI Project ES&H Coordinator, Project Engineers, Task Managers and Technical Group Leaders. The Target Floor Manager also receives input from the L3 Managers for Technical Components. The MINOS Floor Manager also receives input from the L3 Managers for Technical Components and the Near Detector Installation Manager.

Installation Duties: The Floor Managers shall be responsible for

- Coordinating all work activities within their area of jurisdiction in accord with the developed Installation Task List for their area of jurisdiction
- Facilitating to best extent possible the timely completion of work activities
- Identifying potentially unsafe activities or plans and taking appropriate action
- Identifying and taking appropriate action for any instances where the associated hazards of one group activity has the real potential of adversely affecting the safety of other groups
- Critically reviewing and approving submitted Hazard Analyses
- Scheduling of the access shaft for their area of jurisdiction
- Dissemination of necessary technical information on the use of specialized equipment and/or fixtures for or related to installation to Task Managers and Technical Group Leaders as required

- ❖ Resolving conflicts between groups conducting different activities, including those conflicts related to availability of equipment
- ❖ Facilitating the conduct of ES&H reviews of installation work activities as requested by the NuMI Project ES&H Coordinator
- ❖ Being familiar with infrastructure and constraints of the working environment in their area of jurisdiction, including surface buildings, shafts, and underground enclosure
- ❖ Oversight of "Check-In Check-Out" procedures for personnel in underground areas
- ❖ Assigning space for the staging or temporary storage of materials
- ❖ Adherence to the core functions of Integrated Safety Management throughout the installation process.

Source: Staffing of the Floor Manager positions will be requested by the L2 Manager for Technical Components and/or the MINOS Manager from the Beams and/or Particle Physics and Technical Divisions.

Task Manager

Definition: A Division/Section designated individual specifically assigned and competent to oversee and direct a subcontractor work activity. Usually this term is applied to individuals directing the work of Time and Material Subcontractors for specific trades, general construction or service work, or the work specified under a fixed-price subcontract of small size. An approved Task Manager/Construction Coordinator list indicating an individual's experience and competency to direct specific work activities is updated and distributed regularly by the Directorate. Each Division or Section has the responsibility of providing the necessary training for personnel to become qualified Task Managers. (ref. Training requirements in FESHM 7010 under the "Training of Task Managers/Construction Coordinators" heading)

Number: The number of Task Managers assigned to supervise work will depend on the number of subcontractors engaged in work at any one time. A single Task Manager may supervise more than one subcontractor.

Direction: As related to actual performance of the installation, the Task Manager receives direction from the area Floor Manager. As related to the technical or scientific aspects of the installation, the Task Manager receives input and advice from the associated Level 3 Manager for Technical Components or from the Near Detector Installation Manager. With the knowledge and consent of the above referenced managers, the Task Manager is also expected to receive input and advice from engineering and physicist staff and others who are knowledgeable in the design and/or function of the components or equipment being installed.

Installation Duties: The Task Manager is responsible for

- ❖ Providing field management of subcontractor work activity in accord with FESHM Chapter 7010

- ❖ Being the single point of contact between the subcontractor and all other Project personnel
- ❖ Seeing that the subcontractors (excepting T&M) prepare adequate hazard analyses for the work activities
- ❖ Preparing a hazard analysis for particular T&M work activities
- ❖ Obtaining approval of self-prepared Hazard Analyses by the area Floor Manager
- ❖ Following supplied instructions or procedures related to the installation or use of specialized equipment and/or fixtures for or related to installation
- ❖ Identifying potentially unsafe activities or plans by the subcontractor and taking appropriate corrective or preventative actions
- ❖ Assistance in the prevention and resolution of conflicts between groups conducting different activities
- ❖ Being familiar with infrastructure and constraints of the working environment in area of activity, including surface buildings, shafts, and underground enclosure
- ❖ Active participation in the "Check-In Check-Out" procedures for personnel in underground areas
- ❖ Active participation in the core functions of Integrated Safety Management throughout the installation process.

Source: Task Managers will be requested by the Level 2 Manager of Technical Components and/or the MINOS Manager from the Beams, Particle Physics and Technical Divisions.

Technical Group Leader

Definition: An individual responsible and competent for overseeing, directing and often participating in installation work activities performed by a team of technicians. The related work activities are either generally or specifically exempt from Davis-Bacon requirements.

Number: The number of Technical Group Leaders assigned to supervise work will depend on the number, nature and location of such work instances. A single Technical Group Leader may supervise more than one team of individuals.

Direction: As related to actual performance of the installation, the Technical Group Leader receives direction from the area Floor Manager. As related to the technical or scientific aspects of the installation, the Technical Group Leader receives input and advice from the associated Level 3 Manager for Technical Components or from the Near Detector Installation Manager. With the knowledge and consent of the above referenced managers, the Technical Group Leader is also expected to receive input and advice from engineering and physicist staff and others who are knowledgeable in the design and/or function of the components or equipment being installed.

Installation Duties: The Technical Group Leader is responsible for

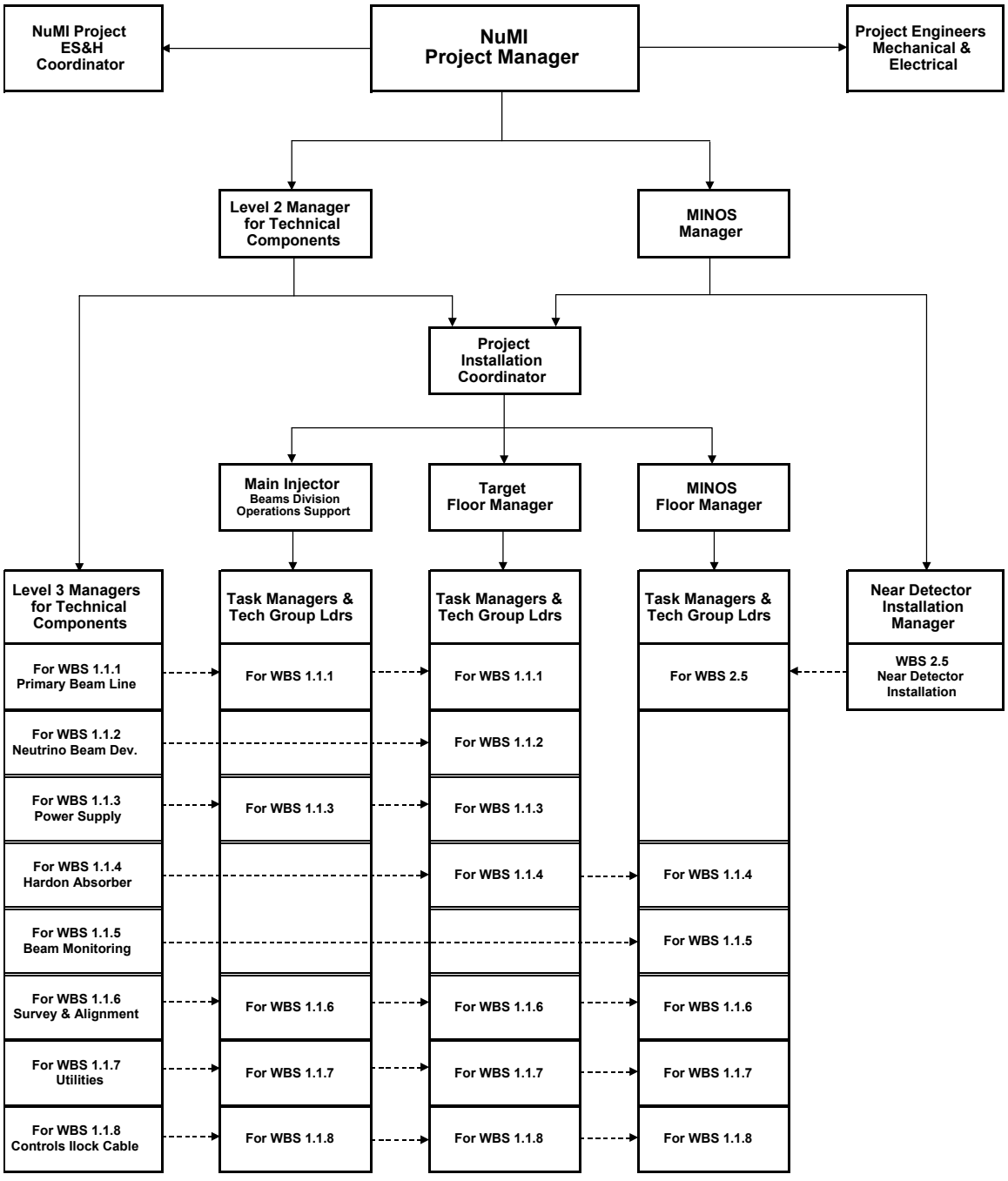
- ❖ Overseeing, directing and often participating in installation work activities performed by a team of technicians

- ❖ Being the single point of contact between his/her team of individuals performing work and all other Project personnel
- ❖ Following supplied instructions or procedures related to the installation or use of specialized equipment and/or fixtures for or related to installation
- ❖ Identifying potentially unsafe activities or plans of the installation team and taking appropriate corrective or preventative actions
- ❖ Preparing a Hazard Analysis for hazardous work activities to be performed by the team
- ❖ Obtaining approval of self-prepared Hazard Analyses by the area Floor Manager
- ❖ Assistance in the prevention and resolution of conflicts between groups conducting different activities
- ❖ Active participation in the "Check-In Check-Out" procedures for personnel in underground areas
- ❖ Being familiar with infrastructure and constraints of the working environment in area of activity, including surface buildings, shafts, and underground enclosure
- ❖ Active participation in the core functions of Integrated Safety Management throughout the installation process.

Source: Technical Group Leaders will be requested by the Level 2 Manager of Technical Components and/or the MINOS Manager from the Beams, Particle Physics and Technical Divisions, and the MINOS Collaboration.

A graphical depiction of the major players involved in NuMI installation activities is presented in the following chart.

NuMI INSTALLATION TEAM



GEOGRAPHIC AREAS of INSTALLATION ACTIVITIES

Realization of the NuMI Project involves installation of technical and scientific components in already constructed facilities and in areas of new construction.

Areas of already constructed facilities include:

- Main Injector beamline enclosure between Q601 and Q624
- NuMI stub area of the Main Injector enclosure
- MI-60 South Power Supply Room
- MI-60 North Equipment Gallery and Power Supply Room
- MI-62 Service Building

Areas of new construction accessible from the new Target Service Building (TSB) include:

- TSB Electrical and Electronics Rooms
- TSB Access Shaft between ground level and the below enclosure
- Downstream end of the Carrier Tunnel
- Pre-Target enclosure
- Target Hall
- Target Hall Support Rooms
- Decay Pipe passageway

Areas of new construction accessible from the new MINOS Service Building (MSB) include:

- MSB Electrical/Mechanical Area
- MSB Access Shaft between ground level and the below enclosure
- Absorber Hall
- Decay Pipe passageway
- Absorber Access Tunnel
- Muon Alcoves 1,2 and 3
- MINOS Hall including MINOS Access Tunnel

A graphical listing of these areas and associated WBS installation involvement is presented in the following chart.

GEOGRAPHICAL AREAS vs. WBS WORK ACTIVITIES

		WBS 1.1.1 Primary Beam Line	WBS 1.1.2 Neutrino Beam Devices	WBS 1.1.3 Power Supply	WBS 1.1.4 Hardon Absorber	WBS 1.1.5 Beam Monitoring	WBS 1.1.6 Survey & Alignment	WBS 1.1.7 Utilities	WBS 1.1.8 Controls Ilock Cable	WBS 2.5 Near Detector Installation
Main Injector	Main Injector Beamline Enclosure Between Q601 and Q624	X					X	X	X	
	NuMI Stub Area of the Main Injector Enclosure	X					X	X	X	
	MI-60 South Power Supply Room			X				X	X	
	MI-60 North Equipment Gallery and Power Supply Room			X				X	X	
	MI-62 Service Building	X		X				X	X	
Target	TSB Electrical and Electronics Rooms	X		X				X	X	
	TSB Access Shaft	X	X	X	X			X	X	
	Downstream End of the Carrier Tunnel	X					X	X	X	
	Pre-Target Enclosure	X					X	X	X	
	Target Hall		X	X	X		X	X	X	
	Target Hall Support Rooms		X	X				X	X	
	Decay Pipe Passageway								X	
MINOS	MSB Electrical/Mechanical Area							X	X	
	MSB Access Shaft				X			X	X	X
	Absorber Hall				X	X	X			
	Absorber Access Tunnel					X	X	X	X	
	Muon Alcoves 1,2 and 3					X	X			
	MINOS Hall including MINOS Access Tunnel						X	X	X	X

X Indicates Major Activity in Area with Significant Potential of Interferring with Other Activities

X Indicates Minor Installation Activity in Area with Minimal to No Affect on Other Activities

ACCESS RESTRICTIONS RELATIVE to the INSTALLATION PLAN

Areas of new construction are presently unavailable with the Tunnels and Halls Subcontract currently in progress. The Service Building and Outfitting (SB&O) Subcontract is thought to start no later than January 2003. Associated beneficial occupancy of the two service buildings and all underground areas is presently expected by December 2003. The majority of installation activities will initiate at this time.

Access to already constructed facilities is varied. While access to the MI-60 and MI-62 Service Buildings is not limited, access to the Main Injector enclosure is afforded only during times of accelerator shutdown. These times are classified as "controlled" or "supervised" access. The ability to perform work during times of controlled access is highly limited to the point of being practically precluded. The occasion and duration of accelerator supervised access shutdowns is planned by the Beams Division and the Directorate. While always subject to Laboratory programmatic needs, shutdowns of several weeks or more usually occur in the summer months. With this general assumption, the NuMI Project plans for installation work activities in the MI enclosure during "summer shutdowns" of 2002, 2003 and 2004. These shutdowns are expressed in the Laboratory's "Long Range Schedule" and are additionally characterized as two 4 to 6 week shutdowns per calendar year.

Conduct of work in the NuMI stub area and its new extension is fundamentally precluded by the presence of a temporary thirty foot long radiation shielding wall at the entrance to the stub area. The scope and duration of installation activities in this area demands that the shield wall be removed permanently at the beginning of the first 2003 summer shutdown, whenever that might occur. By the end of this shutdown, a suitably positioned personnel barrier at approximately the mid-point of the Carrier Tunnel will be installed to preclude access to the upstream portion of the Carrier Tunnel and NuMI Stub from the downstream NuMI enclosure. Given that the NuMI stub area and upstream portion of the Carrier Tunnel are and will be functionally considered as part of the Main Injector enclosure, it will then be available only when the Main Injector is in shutdown status. The SB&O subcontract specifies a modest amount of outfitting between the planned barrier and the NuMI Stub area. The SB&O subcontractor's schedule for completion of this aspect of outfitting is not yet known, nor the actual date of the first 2003 shutdown. While it is hoped that schedules will mesh, there remains a possibility that SB&O subcontractor access to the upstream portion of Carrier Tunnel will be limited to times of accelerator shutdown.

Planning and performance of work in the Main Injector enclosure areas requires additional coordination with the Beams Division Operations, Main Injector and Mechanical Support Departments.

When TSB and MSB are available, equipment access to the underground area is limited by the single access shaft at each location. Personnel access between both Target and MINOS Service Buildings and underground areas will be in accord with a defined Check-In Check-Out (CICO) procedure currently in development. Additionally, the number of individuals underground at the MINOS site will be limited to no more than

twenty-four (24). The boundary between the Target and MINOS underground areas has been determined to be the mid-point of the Decay Pipe passageway.

INSTALLATION COORDINATION MEETINGS

NuMI Project meetings occur on a regularly scheduled basis covering a wide variety of topics. Clearly, as installation activities commence, some of these meetings will address specific installation issues. Key players in the installation effort will attend these meetings on an as needed basis.

Additional regularly scheduled meetings will be held to address specific near term coordination of installation activities. At a minimum, these meetings will be attended by the Project Installation Coordinator, the NuMI Project ES&H Coordinator, the Project Engineers, and Floor Managers. Task Managers and Technical Group Leaders will be invited on an as needed basis. The Level 2 and Level 3 Managers, the MINOS Manager, Near Detector Installation Manager, Beams Division Operations Support and interested members of the MINOS Collaboration and other staff will be welcome to attend, if not specifically invited.

JURISDICTION OF NuMI PROJECT AREAS

Upon beneficial occupancy of all service buildings and underground enclosure, these areas will be jurisdictionally divided by the Directorate between the Beams and Particle Physics Divisions. The Beams Division will be the "Landlord" and principal "Tenant" of the Target Service Building, its access shaft and all underground areas upstream of the MINOS access shaft, including the Absorber access tunnel. The Particle Physics Division will be the Landlord and principal Tenant of the MINOS Service Building, its access shaft and landing area, the MINOS Hall access tunnel and the MINOS Near Detector Hall. Responsibilities of the landlords are set forth in FESHM Chapter 1030.

It is expected that the Target Service Building will eventually be re-named as MI-64. This will avoid confusion with the existing Target Service Building located adjacent to the Neutrino Beamline near the Master Sub Station.

APPENDIX A1

EXECUTIVE SUMMARY OF MAJOR NuMI INSTALLATION ACTIVITIES PER GEOGRAPHIC AREA

The Following is Provided to Facilitate An Overall Understanding of Necessary Work. Order of Activities Shown per Area is Not Necessarily in Order of Either Initiation or Completion.

Area 1 **Main Injector Enclosure Between Q601 and Q624**

WBS	Activity Description	Comments
1.1.1	Lambertson Installation at Q608	
1.1.1	V100 and Q101 Installations Near Q609	
1.1.1	Reposition Existing 6 EPB Dipoles to New Lattice Positions	
1.1.1	Reposition Installed Q102 and Q103 Magnets	
1.1.1	Clear Associated Interferances and Install Q104 thru Q107 Magnets	
1.1.1	Install Beam Pipe, Vacuum Components, Trim Elements and Instrumentation Up to Shield Wall	
1.1.1	Install Kickers at Q602 Area	
1.1.3	Install Kicker Cooling System	Plan for some installation in the MI-60 South PS room
1.1.8	Cable Installation and Termination	
1.1.6	Alignment Activities	Rough Layout -Stand - Rough Magnet - Final Magnet.

Area 2 **Main Injector NuMI Stub and Extension**

WBS	Activity Description	Comments
1.1.1	Remove Shielding Wall at Upstream End of Stub Area	Planning for 2003 Long Shutdown. Requires Temporary Removal of MI Dipole near Q615 for Forklif Access.
1.1.8	Install Crane Monorails and Hoists. Load Test.	Plan to Initiate This Work in October 2002 Shutdown. Complete After Shield Wall is Removed.
1.1.1	Install 22 Magnet Stands for 6 B2 Magnets and 5 Quadrupole Magnets	Many of the Stands are Thought to be Heavier and Larger Than Normal
1.1.7	Install 6" LCW piping between MI and Carrier Tunnel	Upstream piping in installed. Downstream Piping to be installed in Carrier Tunnel by SB&O Subcontractor. Plan to Initiate This Work in October 2002 Shutdown. Complete After Shield Wall is Removed.
1.1.8	Install Cable Tray Between MI and Carrier Tunnel	Plan to Initiate This Work in October 2002 Shutdown. Complete After Shield Wall is Removed.Two 18" Trays Likely
1.1.1	Magnet Installation - 6 B2 Magnets and 5 Quadrupole Magnets	2 Days per Magnet and 11 Magnets Total
1.1.8	Cable Installation and Termination	Trim Element Cables from MI-60. Remainder from MI-62. Includes Total Loss Monitors in Carrier Tunnel and Some Runs Through Carrier Tunnel Into Pre-Target Hall
1.1.1	Install Beam Pipe, Vacuum Components, Trim Elements and Instrumentation between End of MI Installation and Carrier Tunnel	Provide for Removable Section of Beam Pipe in Crossover Area. Beam Pipe in Carrier Tunnel Installed by SB&O Subcontractor.
1.1.6	Alignment Activities	Rough Layout -Stand - Rough Magnet - Final Magnet.

Area 3 **MI-60 Service Building**

WBS	Activity Description	Comments
1.1.3	Power Supplies	Completed Except for 2nd Lambertson Supply and Choke Installation
1.1.8	Controls	Basic Infrastructure Largely in Place
1.1.1	Instrumentation Electronics	Underway as controls are fabricated/assembled
1.1.3	Kicker Power Supply	Located in the South Power Supply Room
1.1.3	Kicker Cooling System	Plan for some installation in the MI-60 South PS room, Rest in Enclosure

Area 4 **MI-62 Service Building**

WBS	Activity Description	Comments
1.1.3	Power Supplies	Main Ring Type Supply and Additional Quad Supplies Needed
1.1.8	Controls	Basic Infrastructure Largely in Place
1.1.1	Instrumentation Electronics	Underway as electronics are fabricated/assembled
1.1.7	Upstream LCW System Piping, Pumps, Heat-Exchanger and Expansion Tank	Includes setting equipment and running pipe. Likely to be conducted as a fixed price contract in late FY02 or early FY 03.
1.1.8	Install CMU Wall to Create a Pump Room	Likely to happen after all LCW equipment is set and piping is run.
1.1.8	Electrical Equipment for LCW pumps	Likely to happen after CMU wall is built.
1.2	Exterior Transformer Pad	Civil Construction Expected in CY 2002

Area 5 **Carrier Tunnel**

WBS	Activity Description	Comments
1.2	Install Suitable Barrier at Carrier Tunnel Mid-Point	Personnel Downstream of Barrier Are Safe From MI Beam Accident Conditions with Shiel Wall Removed.
1.1.8	Modify Local NuMI Stub Radiation Safety System to Facilitate Access in Downstream Portion of Carrier Tunel	
1.1.6	Alignment Activities	Rough Layout -Stand - Rough Magnet - Final Magnet.
1.1.1	Install Magnet Stands for 5 Quads	
1.1.1	Magnet Handling Cart	Design Constrained by Available Space
1.1.1	Install Magnets	
1.1.7	Install Beam Pipe, Vacuum Components, Trim Elements and Instrumentation	6" Beam Pipe Largely Installed by SB&O Subcontractor
1.1.1/8	Install Total Loss Monitors	Suspend from Installed Cable Tray
1.1.7/8	Magnet Water and Electrical Connections	
1.1.8	Cable Installation and Termination	Some Cables from Main Injector and Some from Target Service Building

Area 6 **Pre-Target Enclosure**

WBS	Activity Description	Comments
1.1.6	Alignment Activities	Rough Layout -Stand - Rough Magnet - Final Magnet.
1.1.1	Install Magnet Stands for 4 B2 Magnets and 5 Quadrupole Magnets	
1.1.1	Magnet Handling Cart	Design Constrained by Available Space
1.1.1	Install Magnets - 4 B2s and 5 Quads	
1.1.7	Install Beam Pipe, Vacuum Components, Trim Elements and Instrumentation	
1.1.7/8	Magnet Water and Electrical Connections	
1.1.8	Cable Installation and Termination	Some Cables from Main Injector and Some from Target Service Building

Area 7 **Target Hall**

WBS	Activity Description	Comments
1.1.6	Establish Alignment Network	Preferably done before installation starts and preferably done without other activities underway.
1.1.4	Install Upstream Decay Pipe End Cap	Needs to be completed before the target shielding is completed
1.1.2	Install Rails on Bottom of Chase	
1.1.2	Install Outer Aluminum Sheeting	
1.1.2	Install Target Pile Shielding	About 350 ten ton shielding blocks
1.1.2	Target and Horn Carriages, Modules	
1.1.2	Target Pile Cooling Air Handler	
1.1.7	Build and Place Shield Wall	
1.1.8	Install Interlock Gates	One by Shaft and one at Entrance to Decay Pipe Passageway
1.1.8	Install Interlock System	
1.1.2/8	Install and Equip Hot Horn Handling Enclosure	

Area 8 **Target Hall Support Rooms**

WBS	Activity Description	Comments
1.1.3	Horn Charging Power Supplies	Exists in MI-8. Will need to be rigged into the electrical support room
1.1.3	Horn Capacitor Bank	Exists in MI-8. Will need to be rigged into the electrical support room
1.1.7	Target RAW Skid	Will need to be rigged thru the electrical support enclosure and into the mechanical support enclosure.
1.1.7	Horn Raw Skids(2)	Will need to be rigged thru the electrical support enclosure and into the mechanical support enclosure.
1.1.7	Decay Pipe Cooling Skid	Will need to be rigged thru the electrical support enclosure and into the mechanical support enclosure.
1.1.7	Target Pile Cooling DX unit	
1.1.8	Install Controls Racks and Controls Hardware	Anticipating 6 to 8 Racks
1.1.7	RAW Room Shielding Blocks	About 5-7 "B" blocks stood on end

Area 9 **NuMI Target Service Building**

WBS	Activity Description	Comments
1.1.8	Establish FIRUS, CATV and Telephones	Connection to FIRUS Needed for Beneficial Occupancy
1.1.3	Install Pre-Target Magnet Power Supplies	
1.1.8	Install Controls Racks and Controls Hardware	Anticipating 6 to 8 Racks

Area 10 **Decay Pipe Passageway**

WBS	Activity Description	Comments
1.1.8	Install Interlock System - Interlocked Gates at Each End.	
1.1.8	Install Radiation Stack Monitor Cabling	

Area 11 **Absorber Enclosure**

WBS	Activity Description	Comments
1.1.6	Establish Alignment Network	Preferably done before installation starts and preferably done without other activities underway.
1.1.4	Install Decay Pipe Downstream End Cap	Needs to happen before the absorber and its shielding are installed.
1.1.4	Install Mini-Jack Crane	Includes Rails, Jacks and Bridge.
1.1.4	Install Absorber Shielding	
1.1.4	Install Absorber Core	
1.1.4	Install Absorber Cooling RAW Piping	
1.1.5	Install Downstream Hadron Monitor Upstream of Absorber Core	
1.1.5	Install Muon Monitor at Muon Alcove #0 Downstream of Absorber Core	
1.1.4,5,7 &8	Install Cabling for Absorber, Hadron and Muon Monitors. Install Gas Lines for Hadron and Muon Monitors.	Connects to Equipment in Absorber Access Tunnel.
1.1.4	Remove Mini-Jack Crane	

Area 12 **Absorber Access Tunnel**

WBS	Activity Description	Comments
1.1.6	Establish Alignment Network	Preferably done before installation starts and preferably done without other activities underway.
1.1.7	Decay Pipe Cooling Skid	Includes Connection to DP Cooling Lines
1.1.7	Absorber RAW Skid	Includes Connection to Absorber Cooling Lines
1.1.7	Decay Pipe Vacuum Pump Skid	Includes Connection to Decay Pipe
1.1.8	Controls Racks and Hardware	Anticipating 3 to 6 Racks
1.1.5	Hadron and Muon Monitor Electronics	Install in Controls Racks in Access Tunnel just outside of alcoves.
1.1.8	Interlock Gates	
1.1.4	Labyrinth Shielding Blocks	

Area 13 **Muon Alcoves**

WBS	Activity Description	Comments
1.1.6	Establish Alignment Network	Preferably done before installation starts and preferably done without other activities underway.
1.1.5	Install Muon Monitors in Muon Alcoves #1 and #2	
1.1.5, 7&8	Install Cabling and Gas Lines for Muon Monitors.	Connects to Equipment in Absorber Access Tunnel.
1.1.8	Interlock Gates for Alcoves #1, #2 and #3	

Area 14 **MINOS Service Building**

WBS	Activity Description	Comments
1.1.8	Establish FIRUS, CATV and Telephones	Connection to FIRUS Needed for Beneficial Occupancy
1.1.7	Intermediate Loop Cooling Water System	
1.1.8	Pond Pump Vault Interface	
1.1.8	Install Controls Racks and Hardware	Anticipating 2 or 3 Racks
1.1.8	Monitor of MINOS Sump Pumps	

Area 15 **MINOS Hall**

WBS	Activity Description	Comments
1.1.6	Establish Alignment Network	Preferably done before installation starts and without other activities underway.
2.5	Build MINOS Near Detector	
1.1.7	Install MINOS Water Skid	
1.1.8	Establish Controls, CATV and Telephones	

APPENDIX A2

NON DAVIS-BACON WORK ACTIVITIES

PRELIMINARY LISTING

WBS	Activity	Comments / Rationale
1.1.1	Extraction Kicker Installation	Critical Device, Fragile Ceramic Beamtube
1.1.1	Kicker Cooling System Installation	Critical Device, Fragile Ceramic Beamtube
1.1.1	Placement of Beamline Instrumentation	Sensitive and Critical to Operation
1.1.1	Operation of Magnet Handling Carts and Vehicles	Special Skill
1.1.2	Target Installation	Critical Device
1.1.2	Horn 1 and 2 Installation	Critical Device
1.1.3	Horn Transmission Line Installation	Critical to Opearation, Extremely Difficult to Work On After Operations Begin
1.1.2	Hot Horn Handling Practice Activities	Must Be Performed by Fermi Personnel
1.1.2	Install and Equip Hot Horn Handling Enclosure	Critical Components During Hot Horn Handling
1.1.2 & 1.1.3 &1.1.7	Transport of Critical Devices in Target Shaft (Target and Horns, Horn Power Supplies and Capacitor Bank, RAW Skids)	Components Critical to Operation for Which Spares Are Not Readily Available
1.1.4	Certain Elements of Absorber Installation	Critical to Operation, Extremely Difficult to Work On After Operations Begin
1.1.5	Installation of Hadron and Muon Detectors	This Equipment is Closely Associated with the MINOS Detectors
1.1.6	Alignment activities associated with placement of technical components	Establish Network, Rough Layout, Rough Alignment, Final Alignment. Special Skills in Relating to Technica Survey Data
1.1.7	Vacuum System Instrumentation Installation	Sensitive and Critical to Operation
1.1.7	Vacuum System Leak Checking & Bakeout	Special Skills & Equipment Required
1.1.8	Termination of Certain Cables	Special Cables and Terminating Techniques, Certain cables must be Phase Matched
1.1.8	Installation of Radiation Safety System Gates and Barriers	Critical to Proper Operation of the NuMI Radiation Safety System
1.1.8	Radiation Safety System Installation	Installation Procedurally Limited to Certain Fermilab Qualified Personnel
1.1.8	FIRUS Installation	Unique Life Safety System and Concerns
1.1.8	Monitor of MINOS Sump Pumps	Extremely Critical System
Most All	Final Connection of Instrumentation	Specialized Skills
Most All	Installation of Technical Equipment in Equipment Racks	Specialized Skills, Not Part of Basic Plant
Most All	Testing and Commissioning of Technical and/or Scientific Equipment	Specialized Skills
2.5	Near Detector Installation of Experimental Apparatus	Accepted Exemption to D-B